NorriSize™

Valve Sizing Program
Version 3.0

USER MANUAL

Windows 2000/XP

January, 2007

11122 West Little York – Houston, Texas 77041
Tel: (713) 466-3552 ● Fax: (713) 896-7386
www.norriseal.com

ISO 9001
Cert. #30080

Introduction ... 3
Installation ... 3
Project Manager Module ... 4
Project Tree ... 4
Project Information Panel ... 5
Creating Projects ... 5
Creating Project Items ... 5
Editing Projects and Project Items ... 5
Daily Sizing ... 6
Address Book ... 6
Valve Sizing Module ... 7
Service Selection ... 8
Service Data Panel ... 8
Steam Service ... 8
Liquid Service ... 9
Gas Service ... 9
Two-Phase Service ... 9
Case Data Entry ... 9
Units Selection ... 9
Pipe Selection ... 10
Valve Selection ... 10
Calculating Valve Coefficient ... 11
Preliminary Coefficient ... 11
Final Coefficient ... 11
Sizing Results Panel ... 11
File Menu ... 12
New Project… ( ) ... 12
New Project Item… ( ) ... 12
Open Project… ( ) ... 13
Close Project ( ) ... 13
Save Project ( ) ... 13
Export… ... 13
Export Item ... 14
Print… ... 14
Print to File ... 14
Print Project ... 15
Print Item ( ) ... 15
Exit ... 15
Edit Menu ... 15
Options ... 15
General Preferences ... 15
Default Units ... 16
User Information ... 17
Clear Case ... 18
Clear Service Data ... 18
Case Names ... 18

©2007 Norriseal

Calc Prelim C_v ( ) 18
Create New Fluid ( ) 19
Creating a Custom Liquid 19
Creating a Custom Gas 20
Copying From an Existing Fluid 21
Delete Project 21
Delete Project Item 21
View Menu 21
Specification Views 21
Project Items 21
Cv Curve ( ) 22
Calculation Messages ( ) 22
Appendix A: Walkthrough 23
Example 1 23
Example 2 24

Introduction

NorriSize™, the Norriseal Valve Sizing Program, enables one to calculate the required C_v, *Flow Velocity*, *Mach Number* and *Flow Noise* based on a given set of parameters, and aids the user in determining the appropriate valve selection for a fluid service application. The program can automatically provide values for many common fluids; however, the user's knowledge of the environment is essential for proper valve selection for any service application. It is ultimately the user's responsibility to assure the data used for calculations is correct.

Version 3.0 of the program has been written from the ground up, and represents an overwhelming improvement over version 2.x in terms of program interaction and interface design. Efforts have been focused on providing a flexible, project based environment and modularizing the interface to cleanly separate project management tasks from valve sizing. New features include the display of C_v curves, expanded printing options, a simple address book and persistent user preferences which make the program a more effortless tool for sizing valves.

Flow coefficients are calculated using the latest ISA standard S75.01.01-2002 Flow Equations for Sizing Control Valves. Unfortunately, there has been no progress in the draft standard dS75.07.01, so noise prediction is still calculated using ISA standard S75.17-1989 Control Valve Aerodynamic Noise Prediction. Calculation accuracy has been improved over the previous version by implementing a more robust specific gravity calculator and expanding fluid property temperature ranges. Calculation messages have been improved to provide the user with information to correct the problem which causes the message to appear.

Installation

Installation of the Norriseal Valve Sizing Program requires that you have an installed Java Runtime Environment (JRE) version 1.4.x or 1.5.x. Issues have bee identified in version 1.6.x which have not been fully investigated. Regardless of whether you have received your copy of the program on CD or downloaded from our website, you can always get the appropriate version of the JRE from Sun Microsystem's website: http://java.sun.com.

System Requirements

- Microsoft Windows 2000/XP (compatibility w/ Vista is expected)
- Pentium II-233 or higher
- 256MB Memory
- 50MB Free Hard Disk Space
- CD-ROM (for CD installation)
- Installed Printer (for reports)
- Mouse or other pointing device

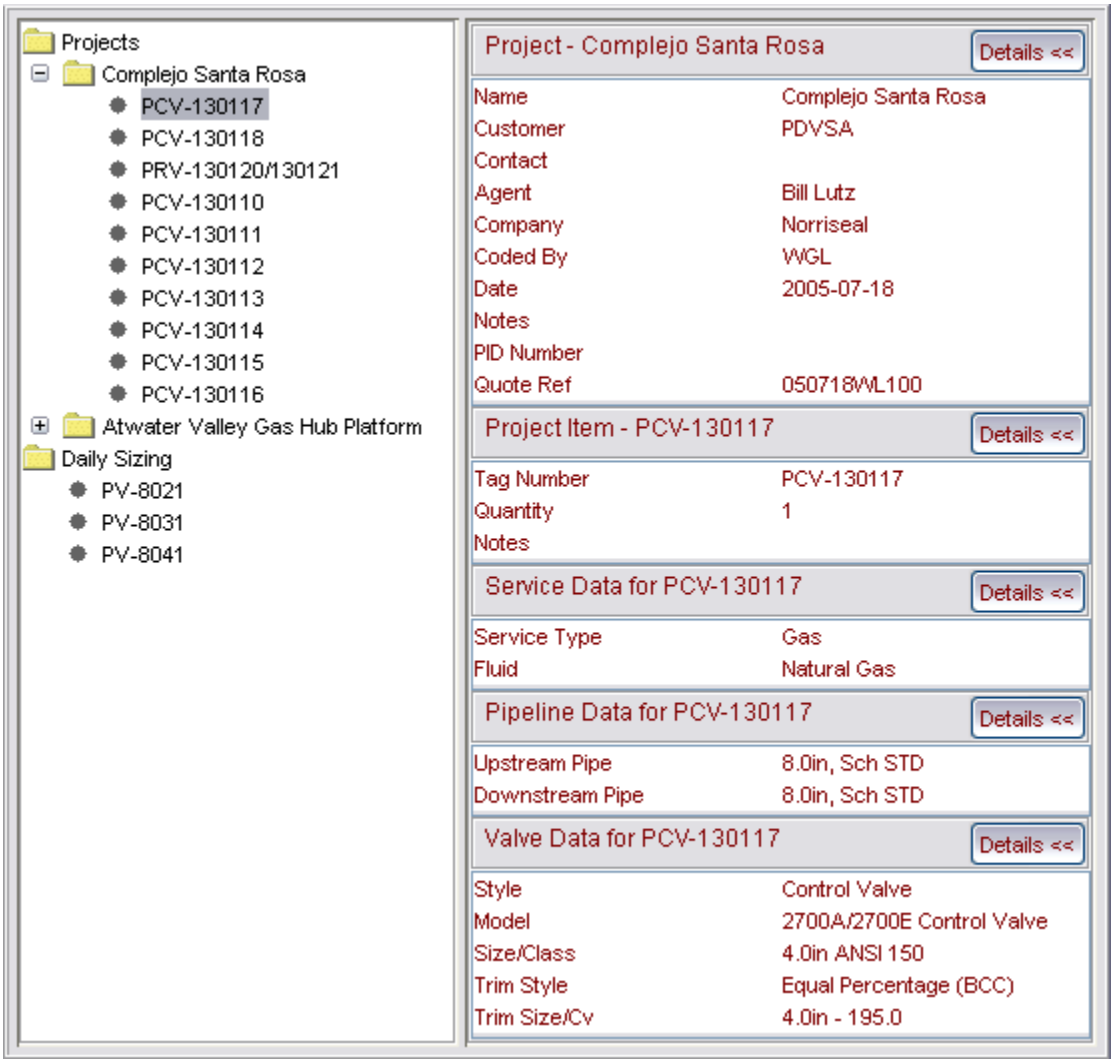
To install the NorriSize™, Norriseal Valve Sizing Program, simply double-click on the self-extracting executable and select a directory into which the files are to be extracted. To run the program, double-click on the NorriSize shortcut found in the directory where the files were extracted. The first

©2007 Norriseal

time the program is executed, Agent and Company dialogs are displayed for entering user-specific information. See **Simple Address Book** for creating and maintaining Agent and Company information.

Project Manager Module

The Project Manager provides the main interface to create and maintain projects. The module consists of the *Project Tree* on the left and the *Project Information* panel on the right. The Project Tree displays open projects and allows the user to navigate through all the items contained within these projects. The Project Information panel displays project and project item information.



Project Tree

Projects that you create are displayed in the *Projects* folder of the project tree. A second project folder named *Daily Sizing* is a permanent project that appears below the Projects folder, and can be used for quick sizing of general inquiries where creating and maintaining a project is not desirable. Project items are displayed under its parent project using the tag number given when the item was created. Selecting a project or project item in the Project Tree will display its information in the Project Information panel. Double-clicking a project item will take you into the Sizing Module for that item.

©2007 Norriseal

Project Information Panel

The Project Information panel displays project, item and specification information for the currently selected project. Only the current project item and its parent project can be edited from the Project Information panel; specification information (if available) is read-only and is intended only to aid the user to more easily identify where and how the item is used. Each display list can be minimized using the *Details*<< button, which is beneficial for low resolution screens when all the information panels cannot be seen at one time. By minimizing an information panel, it is not required to utilize the scroll bar to view information that cannot be displayed due to low resolution screens. An option to permanently hide one or all of the specification information panels is also available to customize project information display to suit the user's preference.

Creating Projects

New projects are created via the *Project Wizard*. To create a new project, select the **File→New Project…** menu item, or the first icon ( ) on the project toolbar. See New Project... in the File Menu section for details on creating new projects.

Creating Project Items

New project items are created via the *Project Item Wizard*. With a project active (i.e. displayed in the *Project Information* panel), select the **File→New Project Item…** menu item, or the second icon ( ) on the project toolbar. New items can also be created while in the Sizing Module. See New Project Item… in the File Menu section for details on creating new project items.

Editing Projects and Project Items

Projects and project items can be edited within the Project Information panel. There are two types of editors within the information panels: an inline text editor for character fields such as the project name or tag number, and an external editor for multiline fields such as an address book object or notes. External editors are shown as an ellipsis button to the right of the selected cell. When pressed, the external editor is displayed to allow changes to be made to the underlying data.

Figure 1: Inline text editor

Figure 2: External object editor

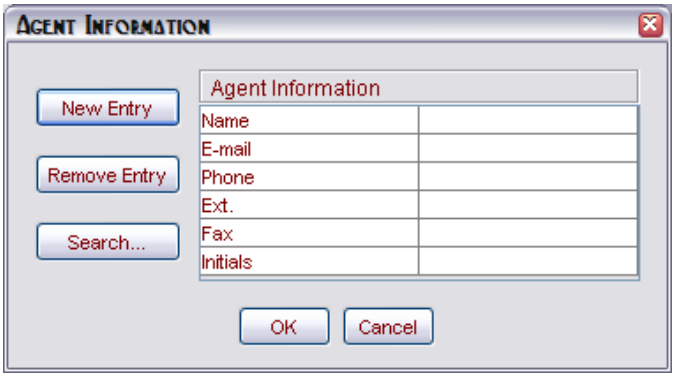
©2007 Norriseal

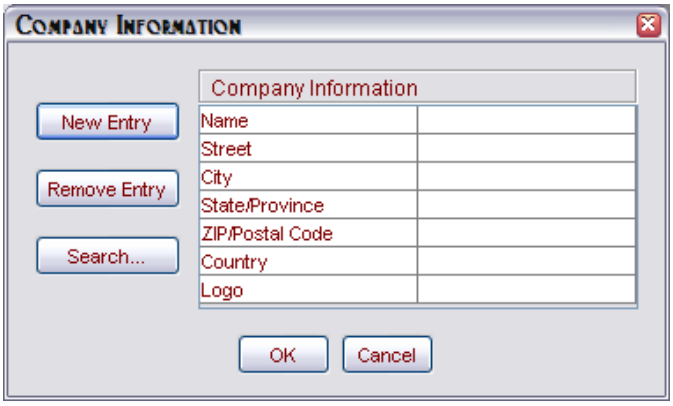
Daily Sizing

The *Daily Sizing* project is automatically updated with the current date and a generic quote reference every time the program is loaded. An option to automatically remove all items of the Daily Sizing folder when the program is closed is available to simplify management of the Daily Sizing folder.

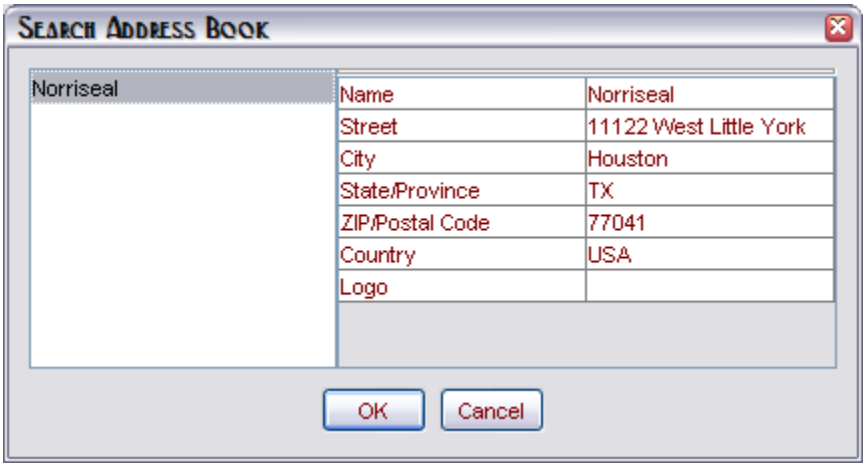
Address Book

The Valve Sizing Program incorporates a simple address book as a convenient method for storing company and agent information. The address book is not directly accessible via any module, but is utilized internally by the program for maintaining contact information in a project. The *Customer*, *Contact*, *Agent* and *Company* fields are address book data objects which can be edited through the external object editors.





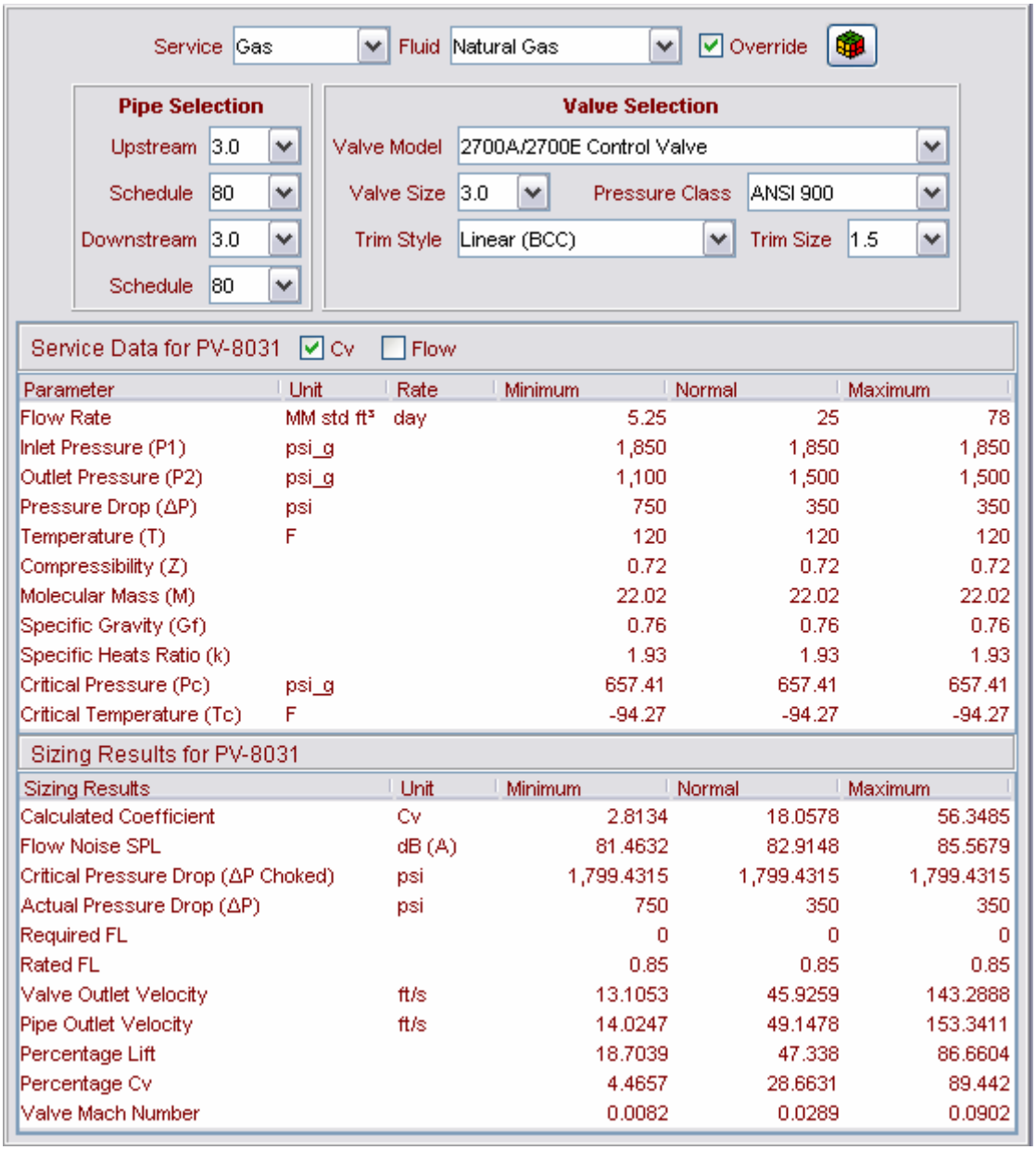
- *New Entry* – Creates a new agent or company address book entry. Multiple entries can be created during the dialog session.
- *Remove Entry* – Permanently removes the current address book entry from the database.
- *Search* – Opens the *Search Address Book* dialog. The list displayed depends on the role of the object being edited (i.e. Customer vs Company). For example, the Customer search dialog will display customers only, whereas the Company dialog will typically only display the user's company. The latter case is illustrated below. Search dialogs cannot edit data.



Changes made to the currently selected address book entry are dynamically updated when the editor is closed using the OK button or New Entry/Search is selected. Changes made to the currently selected item will be discarded when the editor is closed using the Cancel or Close Window buttons.

Valve Sizing Module

The Valve Sizing module provides the main interface to enter service application parameters and perform sizing calculations. The module consists of the *Service Selection* panel at the top, the *Service Data* panel in the center, and the *Sizing Results* panel at the bottom.


Service Gas
Fluid Natural Gas
Override
Pipe Selection
Upstream 3.0
Schedule 80
Downstream 3.0
Schedule 80
Valve Selection
Valve Model 2700A/2700E Control Valve
Valve Size 3.0
Pressure Class ANSI 900
Trim Style Linear (BCC)
Trim Size 1.5
Service Data for PV-8031 Cv Flow
Parameter Unit Rate Minimum Normal Maximum
Flow Rate MM std ft³ day 5.25 25 78
Inlet Pressure (P1) psi_g 1,850 1,850 1,850
Outlet Pressure (P2) psi_g 1,100 1,500 1,500
Pressure Drop (ΔP) psi 750 350 350
Temperature (T) F 120 120 120
Compressibility (Z) 0.72 0.72 0.72
Molecular Mass (M) 22.02 22.02 22.02
Specific Gravity (Gf) 0.76 0.76 0.76
Specific Heats Ratio (k) 1.93 1.93 1.93
Critical Pressure (Pc) psi_g 657.41 657.41 657.41
Critical Temperature (Tc) F -94.27 -94.27 -94.27
Sizing Results for PV-8031
Sizing Results Unit Minimum Normal Maximum
Calculated Coefficient Cv 2.8134 18.0578 56.3485
Flow Noise SPL dB (A) 81.4632 82.9148 85.5679
Critical Pressure Drop (ΔP Choked) psi 1,799.4315 1,799.4315 1,799.4315
Actual Pressure Drop (ΔP) psi 750 350 350
Required FL 0 0 0
Rated FL 0.85 0.85 0.85
Valve Outlet Velocity ft/s 13.1053 45.9259 143.2888
Pipe Outlet Velocity ft/s 14.0247 49.1478 153.3411
Percentage Lift 18.7039 47.338 86.6604
Percentage Cv 4.4657 28.6631 89.442
Valve Mach Number 0.0082 0.0289 0.0902

©2007 Norriseal

Service Selection

The Service Selection panel is used to describe the service environment, and contains the following components:

- *Service* – A drop-down list for the type of fluid service: Liquid, Gas, Steam or Two-Phase.
- *Fluid* – A drop-down list for selecting the fluid. The fluid list is automatically updated for the service type selected. Selecting a different fluid when the *Fluid Override* is checked will disable the override for the new fluid in order to calculate its properties.
- *Fluid Override* – A check box to override the default fluid properties calculated by the program. Checking this component allows the user to enter custom fluid data which more accurately reflects the service environment, such as specific gravity or vapor pressure. Unchecking the component reverts fluid properties to their predefined values based on the current temperature and pressure of the service data. When the Fluid Override is unchecked, the fluid is considered *dynamic* because changes in service conditions recalculate the fluid's properties. When checked, the fluid is considered *static* because changes in service conditions will not affect fluid property values.
- *Calculate* button – Calculates the flow coefficient and noise prediction. The program does not perform calculations automatically. ***NOTE:*** ***Any change made to the data of the sizing module requires the user to recalculate the results. The percentage of rated C_v is updated, for the benefit of comparison, in the sizing results panel when a change to the trim is made.***
- *Pipe Selection* – Provides pipe sizes and schedules to select for the service. ***NOTE:*** ***The pipe selection panel is not enabled until a preliminary C_v has been calculated.***
- *Valve Selection* – Provides valve and trim options to select for the service. ***NOTE:*** ***The valve selection panel is not enabled until a preliminary C_v has been calculated.***

Service Data Panel

The Service Data panel is used to describe the variable properties of the service environment, and contains the following components:

- C_v check box – Selected by default, calculations are solving for C_v
- *Flow* check box – When selected, calculations are estimating flow. ***NOTE:*** ***Flow calculations are only an estimate, and may not accurately reflect the maximum flow due to the iterations required to solve for C_v. It is the user's responsibility to recalculate solving for C_v to determine if the estimated flow meets the actual C_v rating of the associated trim.***
- *Service Parameters* table – Used for entering service data, the table lists the required parameters for the currently selected service type and provides up to three case scenarios for calculating a flow coefficient. The case scenarios have the default names of *Minimum, Normal and Maximum*, but may be changed on a per-item or global basis to suit the user's preference.

The Service Parameters table contains both system and fluid service conditions. The values required for entry depend on the type of service a valve is being sized for.

Steam Service

- *Flow Rate* – The rate of flow of the fluid through the valve
- *Inlet Pressure (P1)* – The line pressure at the valve inlet
- *Outlet Pressure (P2)* – The line pressure at the valve outlet
- *Pressure Drop (ΔP)* – The pressure drop across the valve

- *Temperature (T)* – The temperature of the fluid flowing through the valve

Liquid Service

In addition to the required values of Steam Service, Liquid Service requires the following values:

- *Vapor Pressure (Pv)* – The vapor pressure of the fluid at the specified temperature for the case
- *Critical Pressure (Pc)* – The critical pressure of the fluid
- *Viscosity (V)* – The viscosity of the fluid at the specified temperature for the case
- *Specific Gravity (Gf)* – The specific gravity of the fluid at the specified temperature for the case

Gas Service

In addition to the required values of Steam Service, Gas Service requires the following values:

- *Compressibility (Z)* – The compressibility of the fluid at the specified inlet pressure for the case
- *Molecular Mass (M)* – The molecular mass of the fluid
- *Specific Gravity (Gf)* – The specific gravity of the fluid at the specified temperature for the case
- *Specific Heats Ratio (k)* – The specific heats ratio of the fluid
- *Critical Pressure (Pc)* – The critical pressure of the fluid
- *Critical Temperature (Pc)* – The critical temperature of the fluid

Two-Phase Service

In addition to the required values of Liquid Service, Two-Phase Service requires the following values:

- *Specific Gravity Gas (Gf)* – The specific gravity of the gas at the specified temperature for the case
- *Specific Heats Ratio (k)* – The specific heats ratio of the gas

Note: Two-phase sizing does not provide flow velocities or noise prediction calculations.

Case Data Entry

Case data entry is a simple process of entering the required parameter values for the specified service type. Entry can begin in any of the min/norm/max scenario columns. The rows have been organized so that all non-fluid related service conditions are at the top, which allows the program to calculate standard fluid properties once all service condition values have been entered. Once a value has been entered, pressing the <Enter> key will focus entry to the next cell in the current column unless the active cell is the last row, in which case focus will jump to the beginning of the next column. Cell navigation can also be performed by pressing any of the arrow keys.

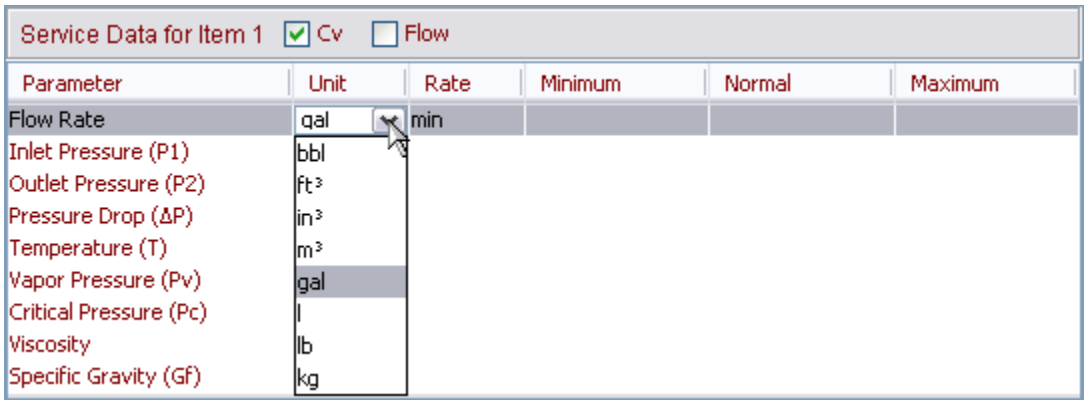
If the fluid properties need to be overridden, it is recommended that all case scenarios' service conditions be entered prior to selecting the Fluid Override checkbox. This allows the Service Data Panel to dynamically calculate the standard fluid properties based on the service conditions entered for the current scenario. Otherwise, by selecting the Fluid Override before all scenarios have been entered, the fluid properties become static and will be copied to the next case without taking into account changes in pressure or temperature. See *Fluid Override* in Service Selection for more information.

Units Selection

Unit selection is straightforward through the use of drop-down lists next to the parameters that are not dimensionless. When selecting a unit for Inlet or Outlet pressure, the corresponding parameter is changed automatically to the selected unit. The Inlet and Outlet pressure units will always use the same

©2007 Norriseal

unit of measure, including the Pressure Drop. Fluid parameters, such as Vapor Pressure and Critical Pressure, may utilize different units of measure. Flow Rates have the time unit independent of the quantity unit as a matter of convenience and to minimize the chance of error in performing manual rate conversions. To change the unit of measure for a parameter, right-click in the far right (east) area of the cell to display the drop-down list of available units.



Pipe Selection

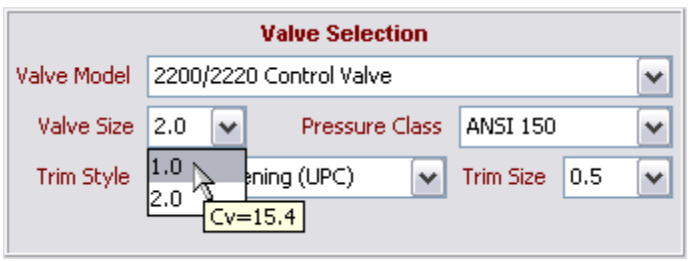
Specifying upstream/downstream pipe size and schedule in the Pipe Selection panel can be as quick as two selections. When making selections for upstream pipe, the downstream pipe is automatically set to the same size/schedule. However, if downstream pipe is different than the upstream pipe, changes to the downstream size/schedule can be made without affecting the upstream size/schedule. Pipe selections are available in inches and schedules defined in ANSI B36.10M-2000.

Valve Selection

The Valve Selection panel provides drop-down lists for specifying the valve to be sized. Each list box is dynamically updated to reflect a change in the valve/trim selection. Pressure classes for Norriseal valves range from ANSI 150 to ANSI 2500, depending on the valve model. The *Valve Size* and *Trim Size* list boxes display rated C_v values when the mouse is hovered over the list (illustrated below), allowing the user to select the appropriate valve/trim size based on the preliminary coefficient. Rated C_v for valves is based on the largest Quick Opening trim size available for each valve size. All valve and trim selections are in inches.

Acronyms in parentheses of the *Trim Style* list box denote the following:

- UPC – Unbalanced Plug Control trim
- BPC – Balanced Plug Control trim
- BCC – Balanced Cage Control trim



Calculating Valve Coefficient

For new project items, flow coefficient calculation is a two-step process: calculating a preliminary coefficient and calculating a final coefficient. Pressing the *Calculate Button* ( ) will perform calculations for all case scenarios in the Service Data Panel.

Preliminary Coefficient

In order to make valve selection more efficient, a preliminary calculation based on generic flow equations is performed prior to making pipe and valve selections. With a preliminary flow coefficient, the user can more easily determine the valve type, size and trim, doing away with the need for trial and error methodologies. After performing the preliminary calculation, the Valve and Pipe Selection panels become accessible, allowing the user to complete the specification for final flow coefficient and noise prediction calculations.

Final Coefficient

The final coefficient calculation is a combination of flow, flow velocity and noise prediction calculations, and can be determined after the valve and pipe selections have been made. When a final calculation is performed, any messages generated from the calculations are displayed in a dialog and are ordered by case scenario. If C_v data is available for the selected trim, a chart which plots the final C_v along the trim's C_v curve can also be displayed.

Sizing Results Panel

Preliminary and final C_v calculation results are displayed beneath the Service Data panel in the Sizing Results panel. The results displayed in the Sizing Results Panel vary depending upon the type of service selected:

- *Calculated Coefficient* – The flow coefficient calculated, either preliminary or final
- *Flow Noise SPL* – The predicted noise generation
- *Critical Pressure Drop* – The pressure drop limit whereupon choked flow occurs
- *Actual Pressure Drop* – The actual pressure drop across the valve
- *Required FL* – The required liquid pressure recovery factor for the valve at the specified service conditions (liquid only)
- *Rated FL* – The rated liquid pressure recovery factor for the selected valve model
- *Valve Outlet Velocity* – The flow velocity at the valve outlet
- *Pipe Outlet Velocity* – The flow velocity at the pipe outlet
- *Percentage Lift* or *Degrees Open* – For plug style trim valves, the percentage of plug travel required to achieve the specified flow rate. For rotary style valves, the amount of rotation of the disc/ball to achieve the specified flow rate.
- *Percentage C_v* – The ratio of the calculated coefficient to the rated coefficient of the valve/trim selection
- *Valve Mach Number* – The ratio of the flow velocity in relation to the speed of sound in the fluid media (gas/vapor only)

©2007 Norriseal

File Menu

New Project… ( )

Displays the *New Project Wizard* and creates a new valve sizing project in the main *Projects* folder. New projects can be created while in either the *Project Manager* or the *Sizing Module*.

- *Project* – The name of the project to create. This is the name that appears in the project tree panel. **This is a required field.**
- *Customer* – The customer for which the project is prepared and will appear in the heading of the printed report. **This is a required field.**
- *Agent* – The name of the company's agent assigned to the project. This field is automatically filled with the current user's information. It can be changed if, for instance, someone other than the current user is the main Agent assigned to the project.
- *Quote Reference* – The quote number/reference assigned to this project. **This is a required field.**
- *Entered By* – The initials of the user performing the valve sizing, if different than the Agent.

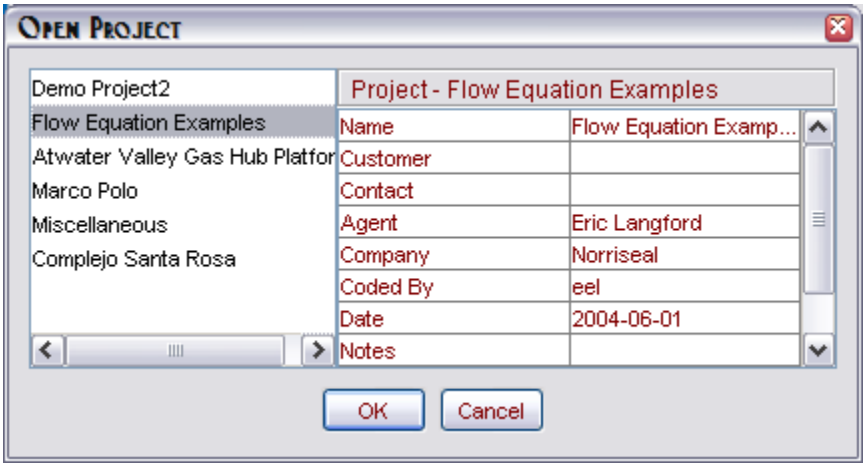
New Project Item… ( )

Displays the *Project Item Wizard* and creates a new project item in the currently selected project. A project must be selected for this action item to be enabled. New project items can be created while in either the *Project Manager* or the *Sizing Module*.

- *Tag No.* – The tag number of the valve (if required) or name of the project item if no tag number is used. This is the name that appears in the project tree panel. If this field is left blank, the default tag name "Item *x*" is used, where *x* is the current item count.
- *Quantity* – The quantity of valves required for this item.
- *Valve* – The type of valve to be sized. This allows the Sizing Module to more accurately calculate a preliminary C_v.
- *Copy From* – Select the project item to use for creating a new project item with identical data

Open Project… ( )

Displays the *Open Project* dialog for selecting one or more projects to add to the *Project Tree* panel. To select multiple projects, hold down the <Control> key and right-click on each of the desired projects to open.



Close Project ( )

Removes the currently selected project from the *Project Tree* panel. The user will be prompted to save any changes made to the project prior to being closed.

Save Project ( )

Saves any changes to the currently selected project and/or project item. The user will be notified that any changes made to the specification of a project item will generate a recalculation prior to being saved.

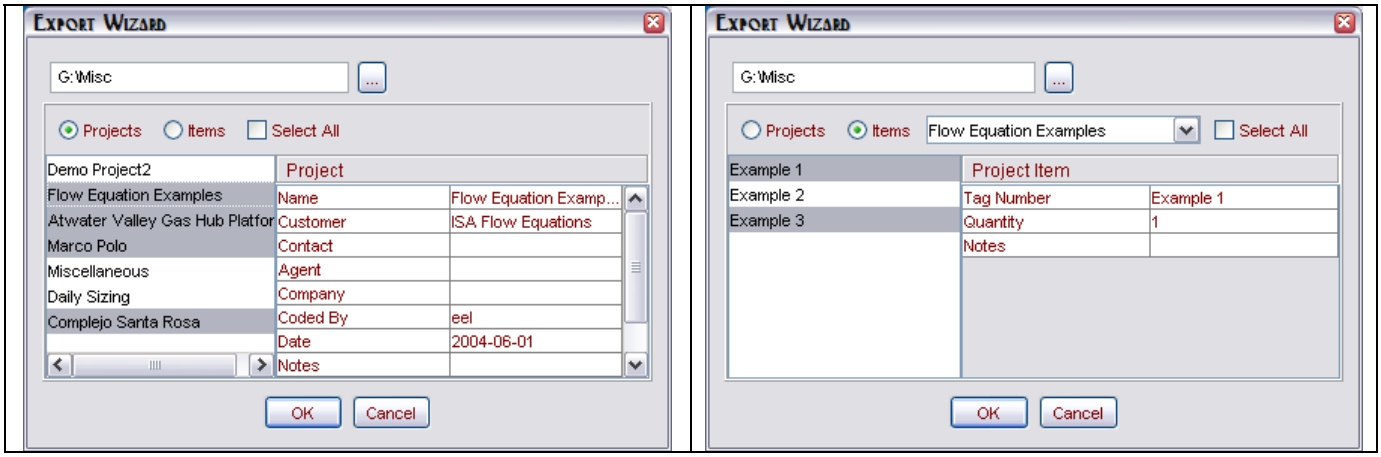
Export…

Displays the *Export Wizard* to export projects and/or project items to an external data file. Projects are saved in an XML format which can be imported back into the program. The *Export Wizard* consists of the following components:

- *Directory Path* text field – determines the directory location files are exported to

©2007 Norriseal

- *File Chooser* button (…) – displays a File Chooser dialog for selecting the directory path
- *Projects/Items* button – switches from project selection to item selection, and vice-versa
- *Select All* checkbox – selects all items in the display list
- *Project* list (Item selection only) – project drop-down list for item selection
- *List Selection* panel – lists projects/items to select from and displays related information. To select multiple projects/items, hold down the <Control> key and right-click on each of the desired list items.



Export Item

Displays a *File Save* dialog to export the currently selected project item to an external data file. Exporting from this menu item differs in that the variables from flow calculations are included, and is intended for technical support purposes only. ***NOTE: Files created may not be capable of being imported back into the program.***

Print…

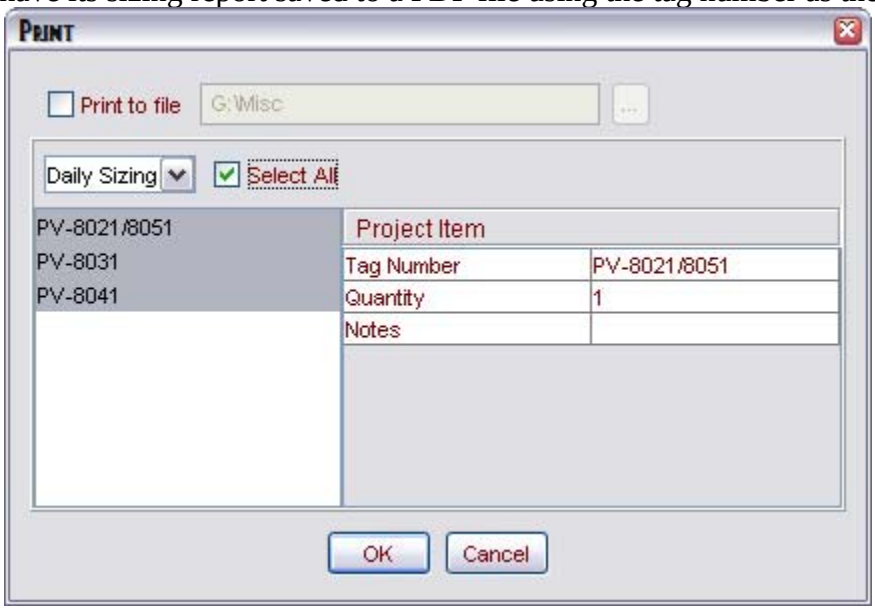
Displays the *Print Wizard* for printing sizing reports of project items from the projects listed in the *Project Tree* panel to the current default Windows printer. The *Print Wizard* layout is similar to the Export Wizard, and consists of the following components:

- *Print to file* checkbox – when selected, writes sizing reports to a PDF file
- *Directory Path* text field – determines the directory location files are exported to
- *File Chooser* button (…) – displays a File Chooser dialog for selecting the directory path
- *Project* list – project drop-down list for item selection
- *Select All* checkbox – selects all items in the display list
- *List Selection* panel – lists items to select from and displays related information. To select multiple items, hold down the <Control> key and right-click on each of the desired items to print.

Print to File

The *Print Wizard* provides the user with the ability to save reports to a file by selecting the *Print to file* checkbox. When selected, the file location can be chosen by either typing the directory path in the text field or via a directory selection dialog by pressing the ellipsis to the right of the text field. It is

highly recommended to use the selection dialog to ensure a valid directory path is chosen. Each project item selected will have its sizing report saved to a PDF file using the tag number as the filename.



Print Project

Prints all items of the currently selected project to the current default Windows printer.

Print Item ( )

Prints the currently selected project item to the current default Windows printer.

Exit

Closes the Valve Sizing Program. The user will be prompted to save any changes made to the project prior to program shutdown.

Edit Menu

Options

Displays the *Options* dialog for customizing various aspects of the Valve Sizing Program and consists of three tabs:

- *General Preferences* – customizes the project and sizing modules
- *Default Units* – customizes the units used for new project items
- *User Info* – customizes the Agent and Company information for the current user

General Preferences

Project Module

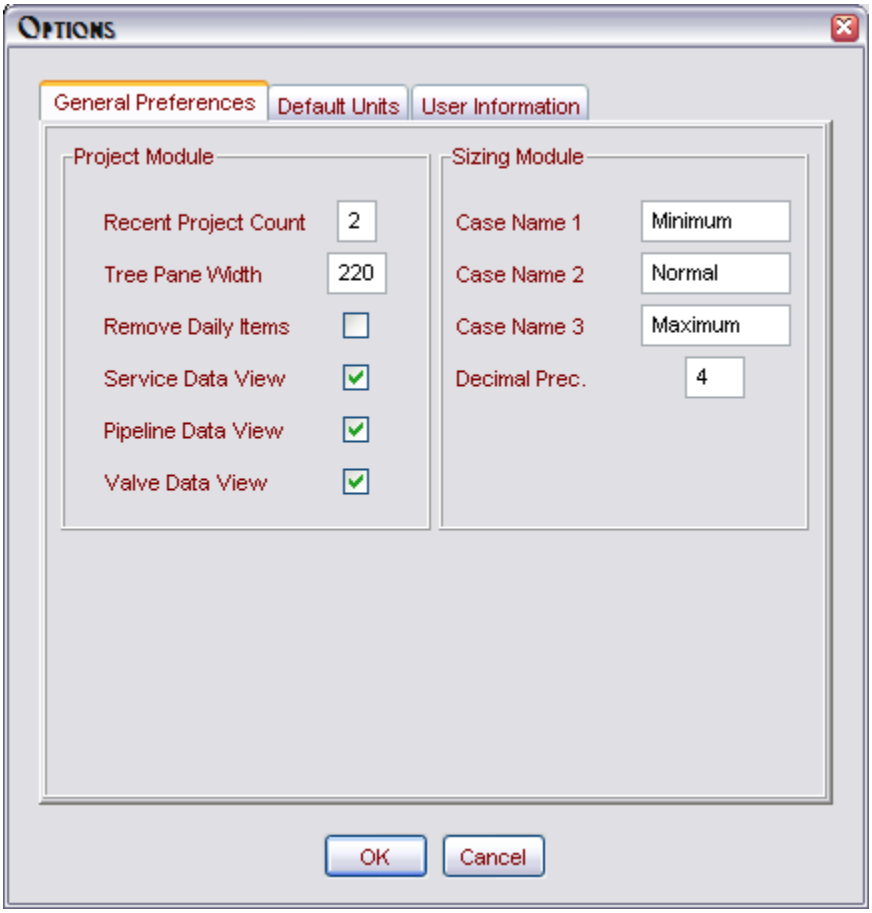
- *Recent Projects* – sets the number of projects to load upon program startup

©2007 Norriseal

- *Tree Panel Width* – sets the width of the *Project Tree* panel in pixels (***NOTE: manually resizing the tree panel using the divider will not change this value***)
- *Remove Daily Items* – determines whether the program deletes all items in the Daily Sizing project upon program exit
- *Service Data View* – sets the visibility of the *Service Data* information panel
- *Pipeline Data View* – sets the visibility of the *Pipeline Data* information panel
- *Valve Data View* – sets the visibility of the *Valve Data* information panel

Sizing Module

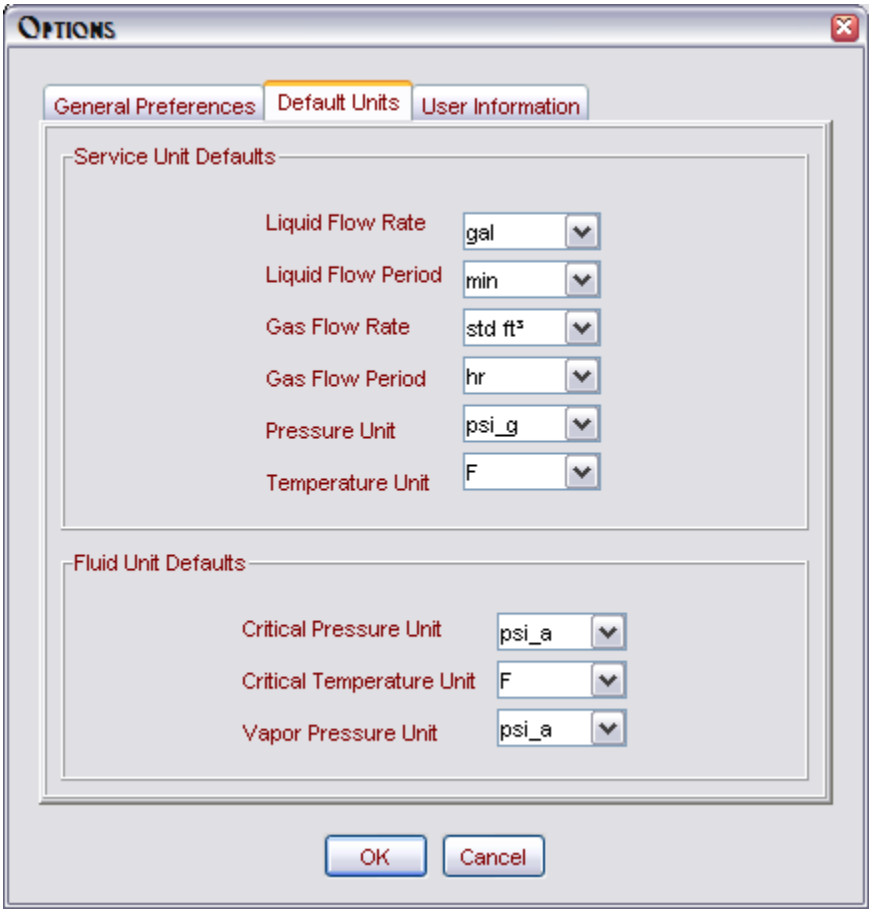
- *Case Name 1* – sets the name of the first case scenario for new project items
- *Case Name 2* – sets the name of the second case scenario for new project items
- *Case Name 3* – sets the name of the third case scenario for new project items
- *Decimal Precision* – sets the number of decimal places to display in the *Service Data* and *Sizing Results* panels



Default Units

As of the release of v3.0, all service and fluid units of measure can be customized for new project items with the exception of viscosity, which will be added in a later release. The default pressure

unit applies to both inlet and outlet pressures, as well as pressure drop (which cannot be changed). For two-phase service, the *Liquid Flow Period* is used as the default time period.



User Information

In the event that a user's contact or company information changes, updates to the address book can be made through the *User Information* tab. User information can be modified by one of two ways: editing the existing entry or creating/selecting a new entry. In order for any address book entry to be saved to the user's profile as the default Agent/Company, it must be created or selected via the *User Information* tab and pressing the OK button of the *Options* dialog.

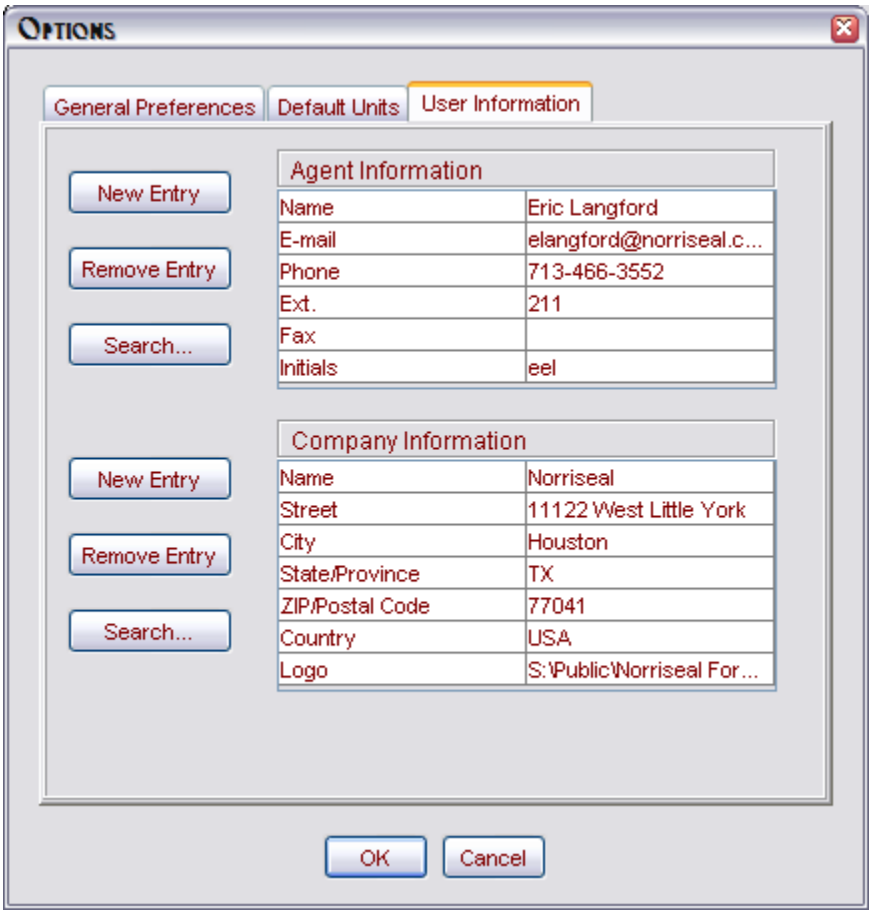
Editing an Existing Entry

When editing an existing Agent or Company address book entry, the changes made will be reflected in all existing projects referencing the entry. This method is useful for updating phone number or e-mail address changes.

Creating or Selecting a New Entry

In some instances, such as having secondary contact information or company address, it is beneficial to create a new address book entry. After creating or selecting a new entry, it will be used as the default Agent/Company for new projects; existing projects will retain the original Agent/Company entry.

©2007 Norriseal



Clear Case

Displays a sub-menu of the case scenarios from which to choose. Selecting a case scenario from the sub-menu will remove all service data and sizing results for that case.

Clear Service Data

Removes all service data and sizing results for each case scenario, effectively reverting to a new item state. Valve and pipeline selections are not affected.

Case Names

Allows modifying case scenario names from the default profile names found in the *General Preferences* tab of the *Options* menu item. Alternate case names are specific to the project item for which they were modified.

Calc Prelim C_v ( )

As a matter of convenience, a preliminary C_v using the standard generic flow equations can be calculated at any time.

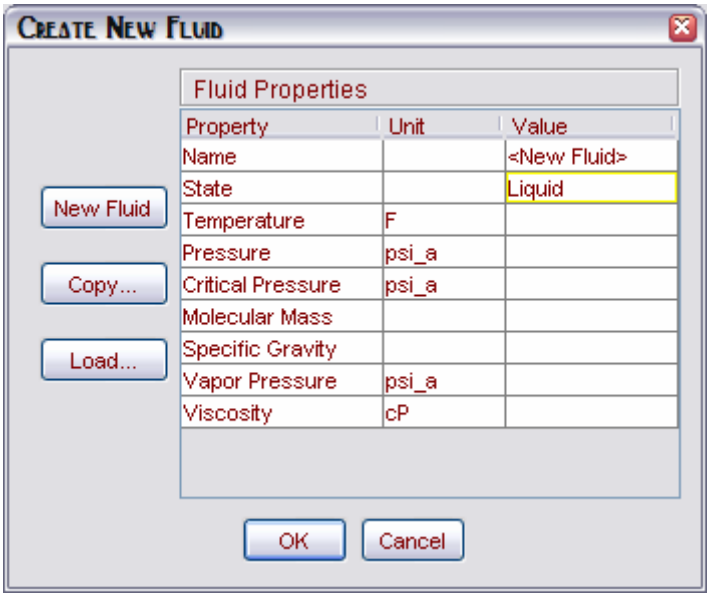
Create New Fluid ( )

Displays the *Create New Fluid* wizard to create a custom fluid that is not available in the standard fluids included with the program. Custom fluids are restricted to a single state, e.g. property values are static and should reflect a fluid's state at the given temperature and pressure. After a custom fluid is created, it is set as the selected fluid for the current project item. The custom fluid only needs to be created for the initial case scenario. When added to the *Sizing Module*, it is set as a permanently overridden fluid which allows fluid property modifications to the other case scenarios. Custom fluids in the *Fluid* list are denoted with an asterisk (*) in front of the fluid name.

Creating a Custom Liquid

Creating a custom liquid is a straight forward process - all fluid property values are required.

- *Name* – Enter the name of the fluid; do not enter an asterisk before the name, this is done automatically by the program
- *State* – switches between liquid and gas custom fluids
- *Temperature* and *Pressure* – select the appropriate unit of measure and enter the values at the valve inlet. ***NOTE: Temperature and Pressure inputs are not required, but are included to provide a complete view of the fluid state while creating the fluid.***
- *Critical Pressure* – select the appropriate unit of measure and enter the critical pressure of the fluid
- *Molecular Mass* – the molecular mass of the fluid
- *Specific Gravity* – the specific gravity of the fluid at the given temperature
- *Vapor Pressure* – select the appropriate unit of measure and enter the vapor pressure of the fluid at the given temperature
- *Viscosity* – the dynamic viscosity of the fluid at the given temperature. ***NOTE: As of initial release, only centipoise is supported for viscosity.***



©2007 Norriseal

Creating a Custom Gas

Creating a custom gas is a little more complex than its liquid counterpart. In addition to the property values for liquid (except vapor pressure), gases include the following required properties:

- *Critical Temperature* – the critical temperature of the fluid
- *Specific Heats Ratio* – the ratio of specific heats of the fluid. ***NOTE: This is typically a difficult value to obtain, therefore a value of 1.4 (SHR of oxygen) can be used when the fluid SHR is unknown. However, care must be taken to use a valid SHR because it is an integral part of the flow equations; e.g. if the actual SHR of the fluid is lower than that of oxygen, the valve may be undersized.***
- *Compressibility* – the compressibility of the fluid at the given pressure. ***NOTE: A value of 1.0 can be used when the fluid compressibility is unknown. However, care must be taken to obtain a valid compressibility factor when a valve is operating at high pressures; e.g. if the actual compressibility is lower than 1.0, the valve may be oversized.***

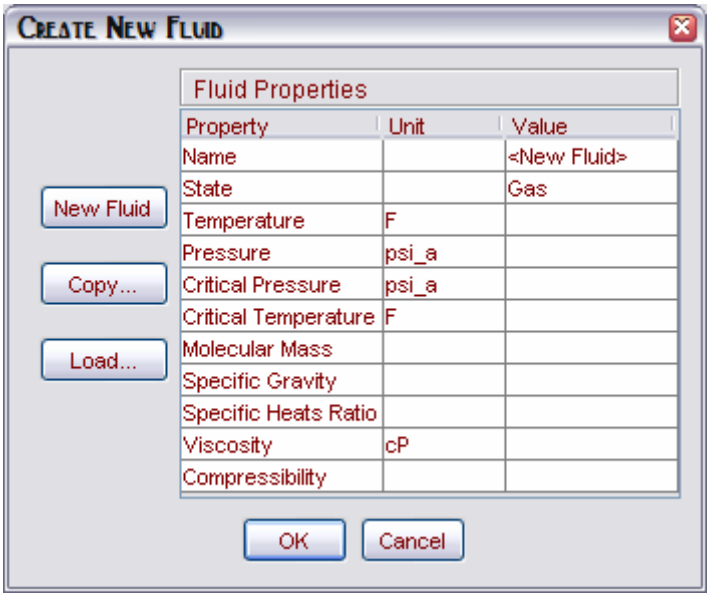
Additional notes regarding fluid properties for gases:

- *Viscosity* – viscosity for gases can be difficult to obtain, therefore a value of .02cP can be used when the fluid viscosity is unknown. Gas viscosities are typically very low and have minimal impact on the flow coefficient, so correctly sizing a valve when the viscosity is unknown can be accomplished with high confidence.
- *Molecular Mass* vs. *Specific Gravity* – specific gravity of gases can be assumed to be a direct relationship to the molecular mass of oxygen. Therefore, if one of these values is unknown, it can be determined from the following equation:

$$M_f \div M_o = G_f$$

where

M_f = molecular mass of custom fluid
M_o = molecular mass of oxygen (32.0)
G_f = specific gravity of custom fluid

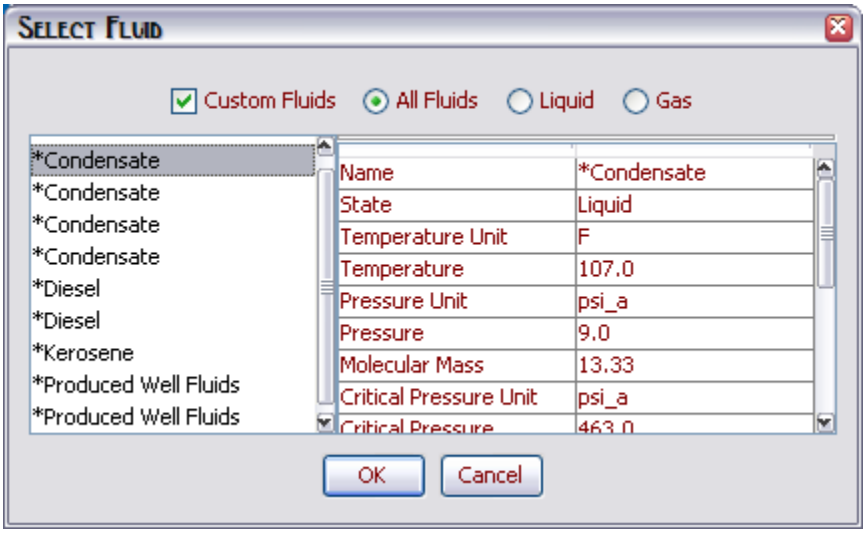


Copying From an Existing Fluid

Often times there are fluids which have similar properties. In such cases, select the *Copy …* button to display the *Select Fluid* dialog which has the following components:

- *Custom Fluids* – checkbox to display only custom fluids that have been created for other project items. The list displays a custom fluid for each case scenario, which typically have different pressure/temperature ranges and the related fluid property values at those ranges.
- *All Fluids* – displays all fluids in the list panel
- *Liquid* – displays only the predefined liquids in the list panel
- *Gas* – displays only the predefined gases in the list panel

NOTE: As of the initial release, the predefined fluids only provide constant fluid property values (Critical Pressure, Molecular Mass, etc.).



Delete Project

Permanently deletes a project from the database and removes it from the project tree panel.

Delete Project Item

Permanently deletes a project item from the database and removes it from the project tree panel.

View Menu

Specification Views

Displays a sub-menu of the specification views from which to choose. Menu items which are checked are displayed in the project information panel. Deselecting an item will hide the associated information panel, and vice-versa. The *Specification Views* menu is linked to the *General Preferences* tab in the *Options* menu, therefore changes made are persistent and saved to the user's profile.

Project Items

As a matter of convenience, a sub-menu listing project items in the current project is displayed, allowing the user to switch to a different item while in another module.

©2007 Norriseal

Cv Curve ( )

Displays the C_v Curve associated with the selected valve trim, and plots the points of intersection of the calculated C_v for each case scenario.

Calculation Messages ( )

Displays the messages generated from coefficient and noise prediction calculations.

Appendix A: Walkthrough

Example 1

This example uses the Daily Sizing project (and assuming no items exist) to size a basic water application using the predefined fluid properties and does not utilize a tag number or quantity.

Fluid:	Water
Flow Rate:	15,000 barrels/day
Inlet Pressure:	15 psig
Outlet Pressure:	10 psig
Temperature:	120 F
Upstream Pipe:	8in Sch 40
DownStream Pipe:	8in Sch 40
Valve Style:	Control Valve

1. Create a new project item
   1.1. Press the *Project Manager* button to display the Project Module.
   1.2. Select the Daily Sizing project in the *Project Tree* panel
   1.3. Display the *Project Item Wizard* by selecting the ***File→New Project Item…*** menu item or pressing the button in the Project toolbar.
      1.3.1. Since there is no tag number and the default valve style is for a Control Valve, press the OK button.
      1.3.2. The new project item is created using the default name *Item 1* and added to the Daily Sizing project.
   1.4. Double-click on the *Item 1* node in the project tree or press the *Sizing Module* button to begin sizing the valve.
2. Service and fluid selection
   2.1. The default service for a new item is Liquid and the default fluid is Water.
3. Service parameters data entry
   3.1. Flow Rate
      3.1.1. Select *bbl* in the Unit column
      3.1.2. Select *day* in the Rate column
      3.1.3. Enter *15000* in the Normal column
   3.2. Inlet Pressure
      3.2.1. Select *psi_g* in the Unit column
      3.2.2. Enter *15* in the Normal column
   3.3. Outlet Pressure
      3.3.1. Enter *10* in the Normal column
   3.4. Temperature
      3.4.1. Select *F* in the Unit column
      3.4.2. Enter *120* in the Normal column
4. Calculate a preliminary C_v
   4.1. Press the button to calculate
   4.2. A preliminary C_v of 194.627 is displayed in the *Sizing Results* panel
5. Pipe and valve selection

©2007 Norriseal

5.1. Pipe Selection
5.1.1. Select *8.0* in the Upstream list box (the Downstream size is automatically selected)
5.1.2. Select *40* in the Schedule list box (the Downstream schedule is automatically selected)
5.2. Valve Selection
5.2.1. Select *2700A/2700E Control Valve* for the Valve Model
5.2.2. Select *8.0* in the Valve Size list box (NOTE: Hovering the mouse cursor over the list selections will display the rated Cv of the valve)
5.2.3. Select *ANSI 150* in the Pressure Class list box (NOTE: ANSI 150 is rated up to 285psi)
5.2.4. Select *Equal Percentage (BCC)* in the Trim Style list box
5.2.5. Select *6.0* in the Trim Size list box for a max Cv of 508 (NOTE: Hovering the mouse cursor over the list selections will display the rated Cv of the trim)

6. Calculate a final C_v
6.1. Press the button to calculate
6.2. The *Sizing Messages* dialog is displayed, stating there were no messages generated by the flow and noise calculations. Press OK to close the window.
6.3. A final C_v of 194.773 is displayed in the *Sizing Results* panel, which is 38% of the valve's flow capacity under normal conditions. The predicted noise generation is 56.4601dB, which is acceptable.
7. Save the results
7.1. Press the button to save the item to the database
8. Print the results
8.1. Press the button to print the sizing report

Example 2

This example uses the Daily Sizing project to size a CO_2 application, overriding the predefined fluid properties and does not utilize a tag number or quantity.

Fluid:	Carbon Dioxide
Flow Rate:	1066 lb/hr min | 63,943lb/hr max
Inlet Pressure:	334 psig
Outlet Pressure:	84 psig
Temperature:	255 F
Compressibility:	0.7055
Specific Gravity:	1.5047

Upstream Pipe:	3in Sch 80
DownStream Pipe:	3in Sch 80
Valve Style:	Control Valve

1. Create a new project item
1.1. Display the *Project Item Wizard* by selecting the ***File→New Project Item…*** menu item or pressing the button in the Project toolbar. If you have not saved any changes made to the previous item, you will be asked to confirm saving the changes.
1.1.1. Since there is no tag number and the default valve style is for a Control Valve, press the OK button.

1.1.2. The new project item is created using the default name *Item 2* and added to the Daily Sizing project.

1.2. Double-click on the *Item 2* node in the project tree or press the *Sizing Module* button to begin sizing the valve.

2. Service and fluid selection
   2.1. Select *Gas* in the Service list box
   2.2. Select *Carbon Dioxide* in the Fluid list box
3. Service parameters data entry
   3.1. Minimum case
      3.1.1. Flow Rate
         3.1.1.1. Select *lb* in the Unit column
         3.1.1.2. Select *hr* in the Rate column
         3.1.1.3. Enter *1066* in the Minimum column
      3.1.2. Inlet Pressure
         3.1.2.1. Select *psi_g* in the Unit column
         3.1.2.2. Enter *334* in the Minimum column
      3.1.3. Outlet Pressure
         3.1.3.1. Enter *84* in the Minimum column
      3.1.4. Temperature
         3.1.4.1. Select *F* in the Unit column
         3.1.4.2. Enter *255* in the Minimum column
   3.2. Maximum case
      3.2.1. Flow Rate
         3.2.1.1. Enter *63943* in the Maximum column
      3.2.2. Inlet Pressure
         3.2.2.1. Enter *334* in the Maximum column
      3.2.3. Outlet Pressure
         3.2.3.1. Enter *84* in the Maximum column
      3.2.4. Temperature
         3.2.4.1. Enter *255* in the Maximum column
   3.3. Override fluid properties
      3.3.1. Select the *Override* checkbox
      3.3.2. Compressibility
         3.3.2.1. Enter *.7055* in the Minimum and Maximum columns
      3.3.3. Specific Gravity
         3.3.3.1. Enter *1.5047* in the Minimum and Maximum columns
4. Calculate a preliminary C_v
   4.1. Press the button to calculate
   4.2. A preliminary C_v of 1.187/71.2006 for Min/Max is displayed in the *Sizing Results* panel
5. Pipe and valve selection
   5.1. Pipe Selection
      5.1.1. Select *4.0* in the Upstream list box (the Downstream size is automatically selected)
      5.1.2. Select XS in the Schedule list box (the Downstream schedule is automatically selected)
   5.2. Valve Selection
      5.2.1. Select *2700A/2700E Control Valve* for the Valve Model
      5.2.2. Select *3.0* in the Valve Size list box
      5.2.3. Select *ANSI 300* in the Pressure Class list box (NOTE: ANSI 300 is rated up to 740psi)

©2007 Norriseal

5.2.4. Select *Equal Percentage (BCC)* in the Trim Style list box
5.2.5. Select *2.0* in the Trim Size list box for a max C_v of 77.2 (NOTE: Hovering the mouse cursor over the list selections will display the rated Cv of the trim)

6. Calculate a final C_v
   6.1. Press the button to calculate
   6.2. The *Sizing Messages* dialog is displayed, stating choked flow exists for both Min/Max conditions, and that flow velocity exceeds .33 sonic under the Max condition. Press OK to close the window.
   6.3. A final C_v of .9958/58.8476 is displayed in the *Sizing Results* panel, which is 1/76% of the valve's flow capacity under Min/Max conditions. The predicted noise generation is 72.5977/106.3498dB, which we will consider unacceptable at the Maximum condition.
7. Eliminate choked flow
   7.1. Change the *Pressure Drop* to *225psi* for both Min/Max conditions.
   7.2. Press the button to calculate
   7.3. The *Sizing Messages* dialog is displayed; choked flow is no longer applicable to either conditions. Press OK to close the window.
8. Reduce valve outlet velocity
   8.1. Method "A"
      8.1.1. Change the *Flow Rate* to *60,000* for the Max condition
   8.2. Method "B"
      8.2.1. Change the *Valve Size* to *4.0*
   8.3. Press the button to calculate
   8.4. The *Sizing Messages* dialog is displayed; the valve's outlet velocity is now acceptable. Press OK to close the window.
9. Reduce the noise level
   9.1. Change the *Trim Style* to *DBII (BCC)*
   9.2. Press the button to calculate
   9.3. The *Sizing Messages* dialog is displayed, stating there were no messages generated by the flow and noise calculations. Press OK to close the window.
   9.4. A final C_v of .9645/57.8625 is displayed in the *Sizing Results* panel, which is 1/62% of the valve's flow capacity under Min/Max conditions. The predicted noise generation is <50/78.5692dB, which is now acceptable at the Maximum condition. (NOTE: Notice that the critical pressure drop has changed. The *Pressure Drop* can be increased to more closely match the original service condition of 250psi)
10. Save the results
    10.1. Press the button to save the item to the database
11. Print the results
    11.1. Press the button to print the sizing report